

A new genus of coprophagous water scavenger beetle from Africa (Coleoptera, Hydrophilidae, Sphaeridiinae, Megasternini) with a discussion on the *Cercyon* subgenus *Acycreon*

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Abstract

A new genus of coprophagous beetle, *Evanesternum* **gen. n.** (Hydrophilidae: Sphaeridiinae: Megasternini), is described in order to accommodate *Cercyon* (*Acycreon*) *pulsatus* d'Orchymont, 1937 from the Republic of South Africa and the Democratic Republic of Congo. A detailed description is provided along with habitus photographs, line drawings and SEM micrographs of relevant diagnostic characters. The new genus possesses the tribal synapomorphies of Megasternini but bears several unique morphological characters which are discussed in detail. The morphology of the remaining three species classified in the subgenus *Acycreon* d'Orchymont, 1942 (i.e. *C. punctiger* Knisch, 1921, *C. collarti* d'Orchymont, 1942 and *C. apiciflavus* Hebauer, 2002), is illustrated in order to provide evidence that *Acycreon* is an assemblage of morphologically dissimilar and likely not related species. An identification key to the Megasternini genera and subgenera known from the Republic of South Africa is presented.

Keywords

Cercyon, *Acycreon*, Afrotropical region, Republic of South Africa, Cape region, Democratic Republic of Congo, dung, morphology, new genus, new combination, subgenus, taxonomy

Introduction

Water scavenger beetles (Hydrophilidae) are mainly known as species associated with a wide variety of aquatic habitats; the majority of the species (ca. 65%) inhabit aquatic and semi-aquatic environments (Short and Fikáček 2011, Bloom et al. 2014). Aquatic species form the vast majority of the subfamilies Hydrophilinae, Chaetarthriinae, Enochrinae and Acidocerinae (Short and Fikáček 2013). However, more than a third of known hydrophilid beetles, mostly belonging to the subfamilies Cylominae and Sphaeridiinae, have colonised terrestrial habitats, typically those with large amounts of decaying organic matter (e.g. tropical forest leaf litter and rotten plant debris). Several groups are also associated with vertebrate dung (usually excrement from large herbivorous mammals) and many taxa are exclusively coprophagous. Dung provides an abundant and rich source of nutrients to a wide range of arthropods, with beetles being amongst them, along with Diptera, the most conspicuous and diverse. Hydrophilids, together with scarabs, are amongst the most important coprophagous beetles (Holter 2004).

The African continent is well known for its abundance of large mammal species, which in turn serve as a source of dung to be exploited. The diversity and abundance of large mammals (especially herbivores) likely promoted the diversification of beetle groups like scarab dung beetles and terrestrial hydrophilids of the subfamily Sphaeridiinae, which are both abundant and diverse in Africa (Davis and Scholtz 2001; Hebauer 2006). The tribe Megasternini is the most diverse group of hydrophilid beetles associated with terrestrial environments, comprising moreover the vast majority of obligatory coprophagous hydrophilid species. Seventeen genera are known to occur in Africa, of which *Cercyon* Leach, 1817, *Pachysternum* Motschulsky, 1863 and *Cryptopleurum* Mulsant, 1844 are especially species-rich. Nine small genera are endemic for the Afrotropical region: *Cercillum* Knisch, 1921 (Central and Southern Africa), *Cyrtonion* Hansen, 1989 (Central Africa), *Delimetricum* Hansen, 1999 (Republic of South Africa), *Parastrongylus* Balfour-Browne, 1948 (Central and Southern Africa), *Pelocyon* Balfour-Browne, 1950 (Central and Southern Africa), *Pseucyon* d'Orchymont, 1948 (Ethiopia), *Quadristerium* Balfour-Browne, 1950 (Rwanda-Burundi), *Acaryon* Hebauer, 2003 (Madagascar) and *Colerus* Hansen, 1999 (Madagascar). All of these are rare in collections and poorly known. They have rarely been mentioned after their description (Balfour-Browne 1948, 1950; Knisch 1921; d'Orchymont 1948) or have been described very recently (Hansen 1999b, Hebauer 2003) and few of them (*Colerus*, *Quadristerium*) are known only from one or a few specimens.

During the recent field work in the Cape region of the Republic of South Africa, the authors discovered a morphologically aberrant tiny representative of the Megasternini which represents an undescribed genus. The review of previously known South African species revealed that the species is already described, but misclassified as part of the subgenus *Acycreon* d'Orchymont, 1942 of the genus *Cercyon*. In this paper, the generic assignment of this species is re-evaluated, a new genus described for it, the morphology of the remaining species assigned at the moment to *Cercyon* (*Acycreon*) is reviewed and the taxonomic composition of this subgenus is discussed.

Materials and methods

This study is based on the specimens deposited in the following entomological collections:

MNRJ	Museu Nacional, UFRJ, Rio de Janeiro, Brazil (B. Clarkson, M. L. Monné);
BMNH	Natural History Museum, London, United Kingdom (M.V.L. Barclay);
CNIN	Colección Nacional de Insectos, Instituto de Biología, Universidad Nacional Autónoma de México, Mexico City, Mexico (S. Zaragoza-Caballero);
FSCA	Florida State Collection of Arthropods, Gainesville, USA (P. Skelley);
KMNH	Kitakyushu Museum of Natural History and Human History, Kitakyushu, Japan (Y. Minioshima);
NHMW	Naturhistorisches Museum, Wien (M. Jäch);
NMPC	National Museum, Prague, Czech Republic (M. Fikáček);
RBINS	Royal Belgian Institute of Natural Sciences, Brussels, Belgium (P. Limbourg);
SANC	South African National Collection of Insects, Pretoria, Republic of South Africa (R. Staals);
SMNS	Staatliches Museum für Naturkunde, Stuttgart, Germany (W. Schawaller);
TMSA	Ditsong National Museum of Natural History, Pretoria, Republic of South Africa (formerly Transvaal Museum) (R. Muller);
ZMUC	Zoological Museum, Natural History Museum of Denmark (A. Solodovnikov).

During the field work, about 15 kg of relatively fresh horse and cow dung was collected in a thick 60 litre plastic bag. The bag was closed and an air buffer was left above the excrement. The bottom of the bag was perforated with 1 cm holes using a knife. This bag was enclosed in another intact bag and hung above the ground in a shaded area. The beetles accumulated overnight in the second bag and were collected in 96% ethanol, without needing to check the excrement by hand.

Part of the specimens examined was dissected, with genitalia embedded in a drop of ethanol-soluble Euparal resin on a small piece of glass glued to cardboard attached below the respective specimen.

Habitus photographs were taken using a Canon D-550 digital camera with attached Canon MP-E65 mm f/2.8 1–5 macro lens. Pictures of genitalia were taken using a Canon D1100 digital camera attached to an Olympus BX41 compound microscope; pictures of different focus were combined in Helicon Focus software. Scanning electron micrographs were taken using Hitachi S-3700N environmental electron microscope at the Department of Paleontology, National Museum in Prague. Pictures used for plates were adapted in Adobe Photoshop CS6. All original pictures including additional views, not presented in this paper, are published and freely available on Flickr (<https://www.flickr.com/photos/142655814@N07/sets/72157681650620964>) and submitted to Zenodo repository (<https://zenodo.org/>) under <https://doi.org/10.5281/zenodo.806765>.

Results

Evanesternum gen. n.

<http://zoobank.org/20A0E313-3427-4049-89DF-0B80D8AEDCEE>

Diagnosis. *Evanesternum* gen. n. can be distinguished from other members of the Megasternini by the following combination of characters: dorsal surface of head and pronotum covered by granulose-reticulate microsculpture (Fig. 4d–e); anterior margin of mentum rounded (Figs 2b, 4b); gena with strong ridge parallel to posterior margin of eye (Fig. 4a); pronotum with broadly and deeply sulcate lateral margins (Fig. 4e); antennal grooves present, small, not reaching lateral margins of pronotum (Fig. 4c); middle portion of prosternum faintly demarcated from antennal grooves by a group of oblique wrinkled sulci (Fig. 4c); mesoventral plate broad, elliptical at base but abruptly vanished in anterior half (Fig. 4g); metaventrite without anterolateral arcuate lines and femoral lines, with very large median raised elevated area almost reaching lateral margins (Figs 3, 4h); male sternite 9 with lateral struts only reaching to half the length of the median projection (Fig. 1f).

Description. Body small, elongate-oval, weakly convex.

Head. Clypeus with anterior margin with fine bead-like protuberance, antero-median margin straight medially, anterolateral corners rounded, antennal bases exposed (Fig. 4a); frontoclypeal suture distinct laterally, reduced medially; transverse ridges absent. Median portion of frons and clypeus not elevated above remaining surface. Whole dorsal surface with coarse transverse, moderately dense punctation, punctures bearing fine decumbent setae. Area between punctures with granulose-reticulate microsculpture (Fig. 4d). Eyes small, situated on lateral angular portions of head, with dorsal portion smaller than ventral one, separated by 6.8–7.5× the width of one eye in dorsal view, posterior margin with an additional ridge present along the posterior margin of eye, arising from its dorsolateral portion and reaching ca. half-way between eye and maxillary articulation ventrally (Fig. 4a). Labrum ca. 0.4× as wide as head, membranous, largely retracted under clypeus, weakly bisinuate on anterior margin, sparsely pubescent dorsally, setae longer on lateral portions (Fig. 2a). Mandible with apex simple, strongly curved, with external margin slightly crenulate in anterior half; prostheca with anterior third lobed and covered by thicker setae (Fig. 2c). Maxilla of male with sucking disc on galea; maxillary palps with basal palpomere minute, palpomere 2 large, widened apically, 1.2× as long as palpomere 3, palpomere 3 about as long as palpomere 4, slightly widening apically, palpomere 4 fusiform, without digitiform sensilla (Fig. 2d). Mentum (Figs 2b, 4b) transverse, ca. 1.7× wider than long, lateral margins with few sparse setae, anterior margin rounded; labial palps trimerous, basal palpomere quadrate, palpomere 2 as long as and narrower than the basal one, with sparse long setae, terminal palpomere narrow, twice as long as the basal one. Submentum with few setiferous punctures, gular sutures vaguely developed, rather widely separated from each other, tentorial pits small, transverse. Antenna (Fig. 4a) with 9 antennomeres; scape long, cylindri-

cal, slightly curved medially; pedicel short, bulbous basally; antennomeres 3–5 short, subequal in length, antennomere 5 widened distad; cupule slightly asymmetrical, slightly shorter than antennomere 5; antennomeres 7–9 forming a weakly elongate pubescent club 1.3× longer than wide, antennomere 7 shortest, antennomeres 8–9 subequal in length, antennomere 9 round at apex; special sensorial antennal fields absent. Genal ridge absent.

Prothorax. Pronotum transverse, moderately convex, about as wide as bases of both elytra combined; lateral margins broadly sulcate; punctation uniform, consisting of coarse transverse punctures, bearing very small setae; punctures deeper and more rounded laterally. Prosternum (Fig. 4c) narrowly longitudinally carinate medially, weakly tectiform; prosternal process elongate, almost reaching posterior margin of procoxae, not bifurcate; prosternal portion anterior of procoxae moderately wide, with two or three oblique faintly defined wrinkled sulci on each side at mid-width. Procoxal cavities large, open posteriorly. Notosternal suture very short. Antennal grooves present, small, vaguely defined posteriad. (Fig. 3).

Mesothorax. Mesoventrite completely fused with an episternum; anterior collar of mesothorax narrow. Median portion of mesoventrite elevated as a mesoventral plate slightly overlapping anterior margin of metaventrite; plate well defined posteriorly as a broad, semi-elliptical tablet abruptly vanished in anterior half leaving only a narrow median ridge. Grooves for reception of procoxae well defined by a conspicuous carina, short, transverse (Fig. 4g). Mesepimeron very narrow, widening laterad. Mesocoxal cavities moderately narrowly separated. Scutellar shield small, semi-elliptical, 1.7× as long as wide. Elytra (Fig. 1a, b) weakly convex, narrowly explanate laterally, each elytron bearing 10 series, series 1–9 consisting of setiferous punctures as large as interval punctures but surrounded by a foveolate depression; punctures in series situated in longitudinal impressed sulci; series 1–4 and 9 reaching apex, series 5 and 8 enclosing series 6–7 subapically, series 10 reduced both anteriorly and posteriorly; epipleuron horizontal, weakly gradually narrowing posteriad, accentuating about half the length of metaventrite, vanishing shortly after the posterior margin of the metaventrite, bearing sparse short setae (Fig. 3).

Metathorax. Metaventrite (Fig. 4h) with anterior rim narrow, widening on anterolateral corners; mesal elevate area flat and very wide, almost reaching lateral margins; anterior and posterolateral corners distinctly rugose, with short setae. Femoral lines and anterolateral ridges absent. Metanepisternum ca. 5× as long as wide, with anterior oblique ridge, metepimeron with minute ventral portion. Metafurca well developed. Metathoracic wings well developed, with transverse vein r_4 arising from basal portion of radial cell, RP rather long, reaching ca. halfway to wing base, basal cubito-anal cell small, closed, wedge cell absent, transverse vein $mp-cua$ joining to $MP_{3+4}+CuA_{1+2}$; anal lobe not defined.

Legs. Procoxae large, subglobular, slightly transverse, with few setae, junction with trochanter; meso- and metacoxae broad, transverse. Tronchatero-femoral junction straight. Femora flattened, with small setae; profemur without impressed parts; metafemur just slightly longer than mesofemur (Fig. 3). Tibiae short, triangular, flat-

tened, with broad and relatively long lateral spines and mesal spines. Tarsi pentamerous, with moderately long tarsomeres (Fig. 3), each tarsomere with few stiff setae ventrally and a few fine setae dorsally; metatarsomere 1 slightly longer than tarsomere 2 and 3 together, tarsomeres 2–4 becoming continuously shorter, tarsomere 5 slightly shorter than tarsomere 1. Claws simple, arcuate; empodium bisetose.

Abdomen with five ventrites. Ventrite 1 with moderately high, broad median carina, briefly extending beyond posterior margin (Fig. 4i). Ventrites 2–5 without mesal carinae. Male sternite IX with tongue-like median projection with acute anterior margin and subtruncate posterior margin, lateral struts reaching half of the length of the median projection (Fig. 1f). Aedeagus (Fig. 1c–e) simple, median lobe subparallel-sided, phallobase long, symmetrical, with manubrium slightly asymmetrical; parameres simple. Female genitalia corresponding to that of *Kanala* (see Fikáček 2010).

Etymology. The generic name is derived from *evanescere* (Latin, “to vanish”) and *sternum* (Greek, “chest”) which refers to the anteriorly vanishing mesoventral plate. The gender is neutrum.

Type and only species. *Evanesternum pulsatum* (d’Orchymont, 1937), comb. n.

***Evanesternum pulsatum* (d’Orchymont, 1937), comb. n.**

Figs 1–5

Basionym: *Cercyon pulsatus* d’Orchymont, 1937: 248.

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Material examined. Paratype: ‘Afrika-Natal, Pietermaritzburg, Fort Napier 1919. Eing. Nr.36. 1926 // Comparé au type: + collze + : 1.55 × 0.82 m // A. d’Orchymont det. *Cercyon* s. str. *pulsatus* paratype // Paratype’ (1: RBINS); Voucher specimens: Republic of South Africa, Western Cape: ‘R. SOUTH AFRICA: W. Cape 6.3 km W Suurbraak; Summerset Getaway Farm at river-bank; 34°0.01'S 20°35.18'E; 110 m a.s.l.; 28.xi–2.xii.2015; Arriaga, Fikáček, Seidel & Vondráček lgt. RSA30a / in cow and horse dung in a farmland’ (85 specimens: BCPC, BMNH, CNIN, FSCA, KMNH, NHMW, NMPC, SANC, TMSA, ZMUC); Eastern Cape: ‘South Africa: Eastern Cape, Amathole District, Nxuba l.m. road to Fort Fordyce Nat Res. ex Excrement, 4–6.i.2015, 32.6906°S, 26.5031°E, P. Šípek & P. Malec’ (1 male: NMPC) [DNA voucher MF1243]. Democratic Republic of Congo ‘Congo Belge: Eala, V.1935, n°527 Sour excréments d’elephant, J. Ghesquière’ (1 male: RBINS); ‘Forêt de Kawa, 23.IV.29, A. Collart // A. d’Orchymont *Cercyon pulsatus*’ (3: RBINS).

Description. *Body*. (Figs 1a–b, 3) 1.22–1.65 mm long; long oval, 1.9–2.0× as long as wide, widest at basal fourth of elytra; moderately convex, 3.0–3.1× as long as high. Integument dull, very weakly shining. Colouration of elytra light-brown, with mouthparts and legs dark reddish-brown and ventral surfaces black. Vestiture composed of minute decumbent setae.

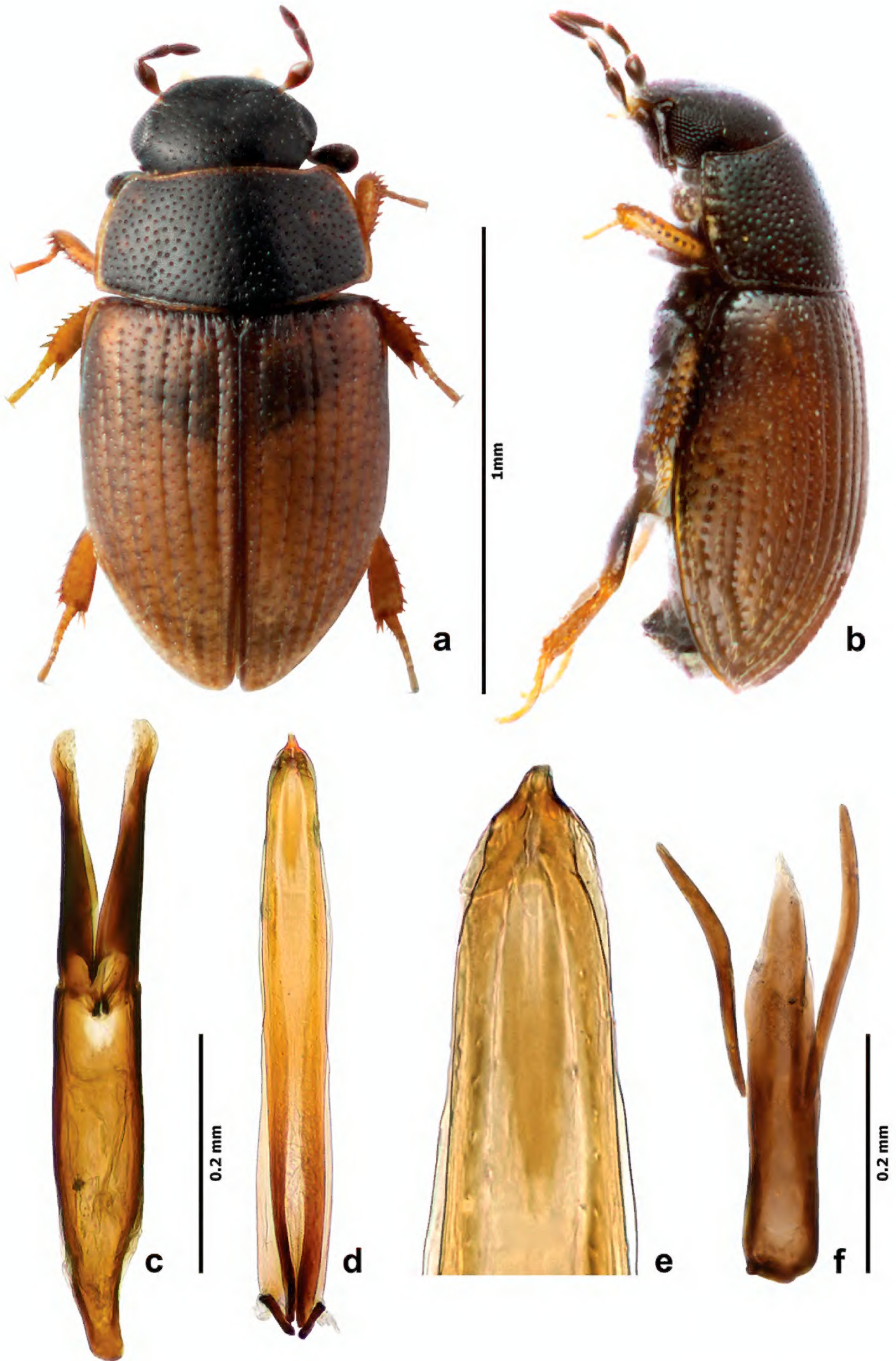


Figure 1. *Evanesternum pulsatum* (d'Orchymont) **a** dorsal habitus **b** lateral habitus **c** tegmen of aedeagus **d** median lobe of aedeagus **e** detail of apex of median lobe **f** 9th sternite.

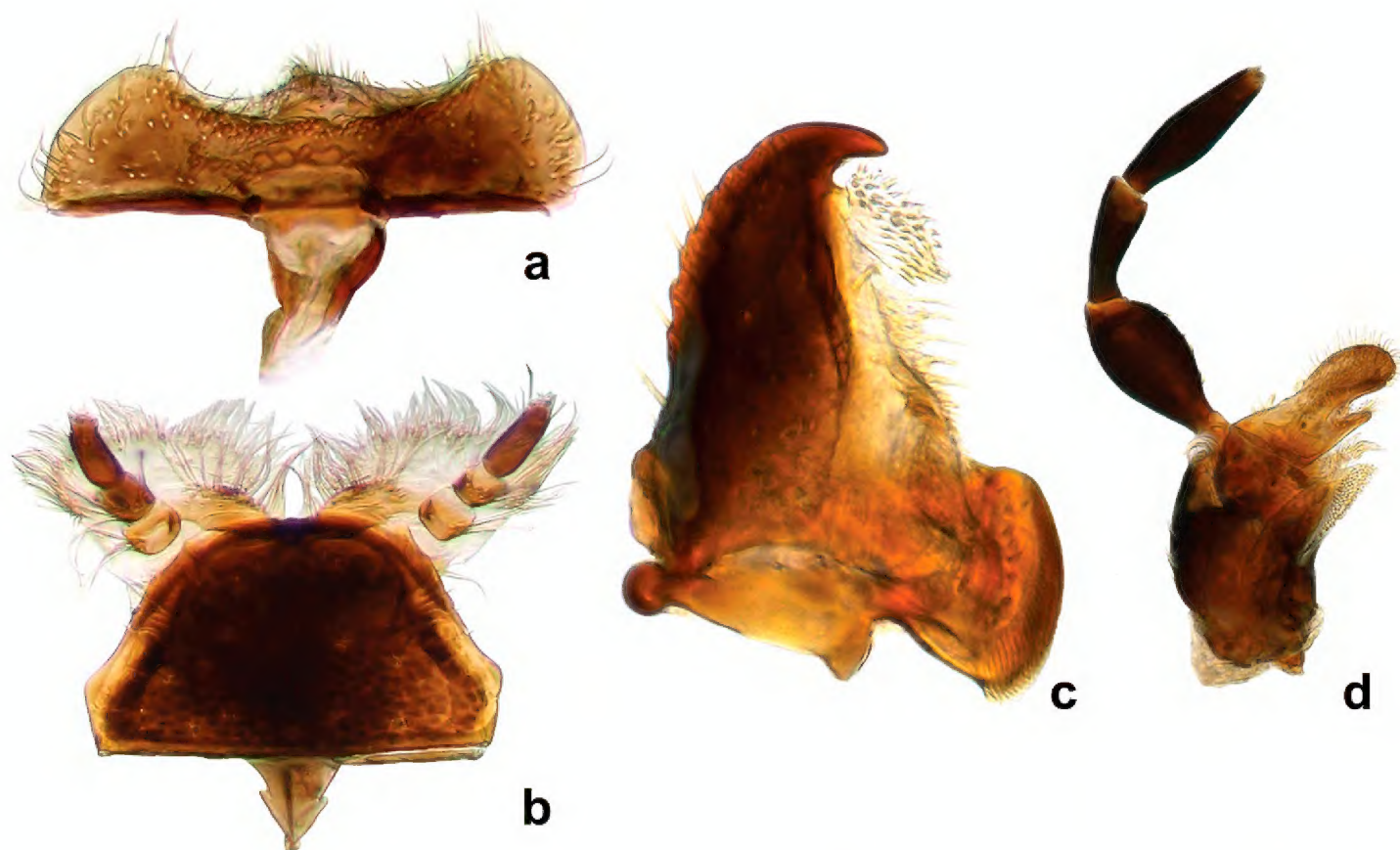


Figure 2. *Evanesternum pulsatum* (d'Orchymont) mouthparts **a** labrum **b** labium **c** mandible **d** maxilla.

Prothorax. Pronotum transverse, widest at base $1.9\times$ wider than long; $1.45\text{--}1.50\times$ wider at base than between anterior angles, $1.8\times$ wider than head including eyes, as convex as elytra in lateral view. Prosternum weakly tectiform medially with anterior margin not thickened or projected ventrally (Fig. 4c). Antennal grooves distinct, weakly curved, open posteriorly (Fig. 3).

Mesothorax. Scutellar shield about $1.7\times$ as long as wide, moderately densely punctured. Elytra widest at anterior fifth, $2.55\text{--}2.64\times$ as long as pronotum, $1.1\times$ as wide as pronotum, punctation composed of crescent-shaped setiferous punctures, larger on the longitudinal series; setiferous punctures present on all intervals (Fig. 4f). Surface between punctures micropunctate. Humeral bulge indistinct. Mesoventral plate semi-elliptical, abruptly vanished in anterior half leaving only a narrow median ridge (Fig. 4g).

Metathorax. Metaventrite (Fig. 4h) with raised area very wide, almost reaching lateral margins, about $1.5\times$ as wide as long, rather roughly punctate, punctures transverse, resembling those on dorsal surfaces, with very small fine setae, surface finely squamose.

Legs. Tibiae robust, with moderately large spines. Metatibiae flattened and short, straight, $0.26\text{--}0.28\times$ as long as elytron, $2.9\text{--}3.2\times$ as long as wide (Fig. 3). Metatarsi moderately long, $0.85\text{--}0.90\times$ as long as metatibiae, with short and stout setae ventrally.

Abdomen with five ventrites. Ventrite 1 with median longitudinal carina present, slightly narrowing posteriad, briefly projecting posteriorly in both sexes (Fig. 4i); ventrite 5 with rounded apex in both sexes, with a group of longer setae on apex.

Genitalia. Median projection of sternite 9 (Fig. 1f) subtruncate apically, without subapical setae, median portion narrowing posteriorly, with posterior end distinctly acute, lateral struts joined at mid length of the median projection. Phallobase (Fig. 1c)

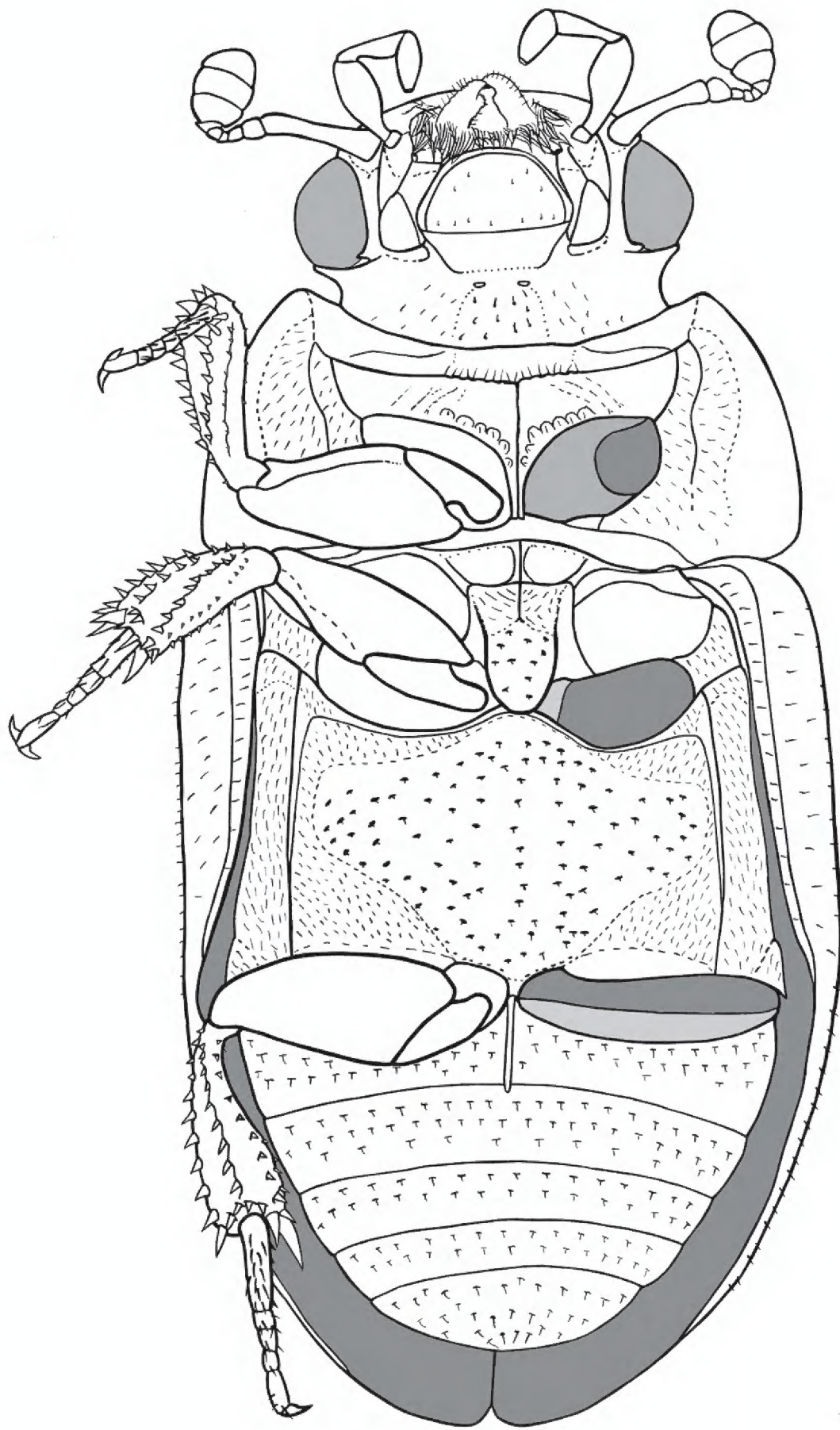


Figure 3. *Evanesternum pulsatum* (d'Orchymont) scheme of ventral morphology.

slightly longer than parameres, asymmetrically narrowing basally, base slightly curved. Parameres weakly narrowing apically, subsinuate and briefly widened near apex. Median lobe (Fig. 1d) narrow, parallel-sided throughout, apex acuminate, with small parallel apical projection, gonopore moderately large, situated subapically.

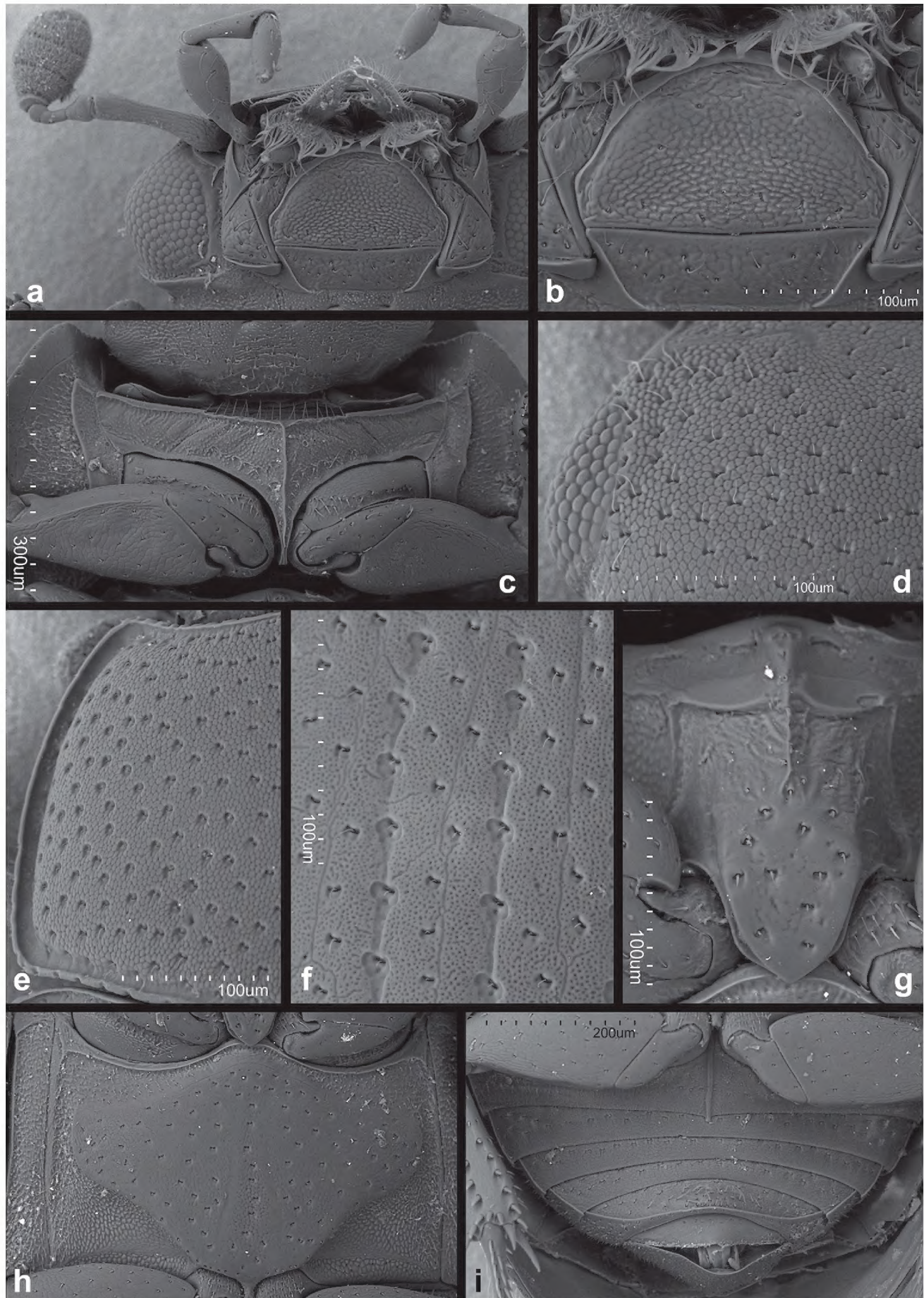


Figure 4. *Evanesternum pulsatum* (d'Orchymont) **a** ventral view of head **b** labium **c** prosternum **d** detail of head surface **e** detail of pronotal surface and lateral margin **f** detail of elytral surface **g** mesoventral plate **h** metaventricle **i** ventral view of abdomen.

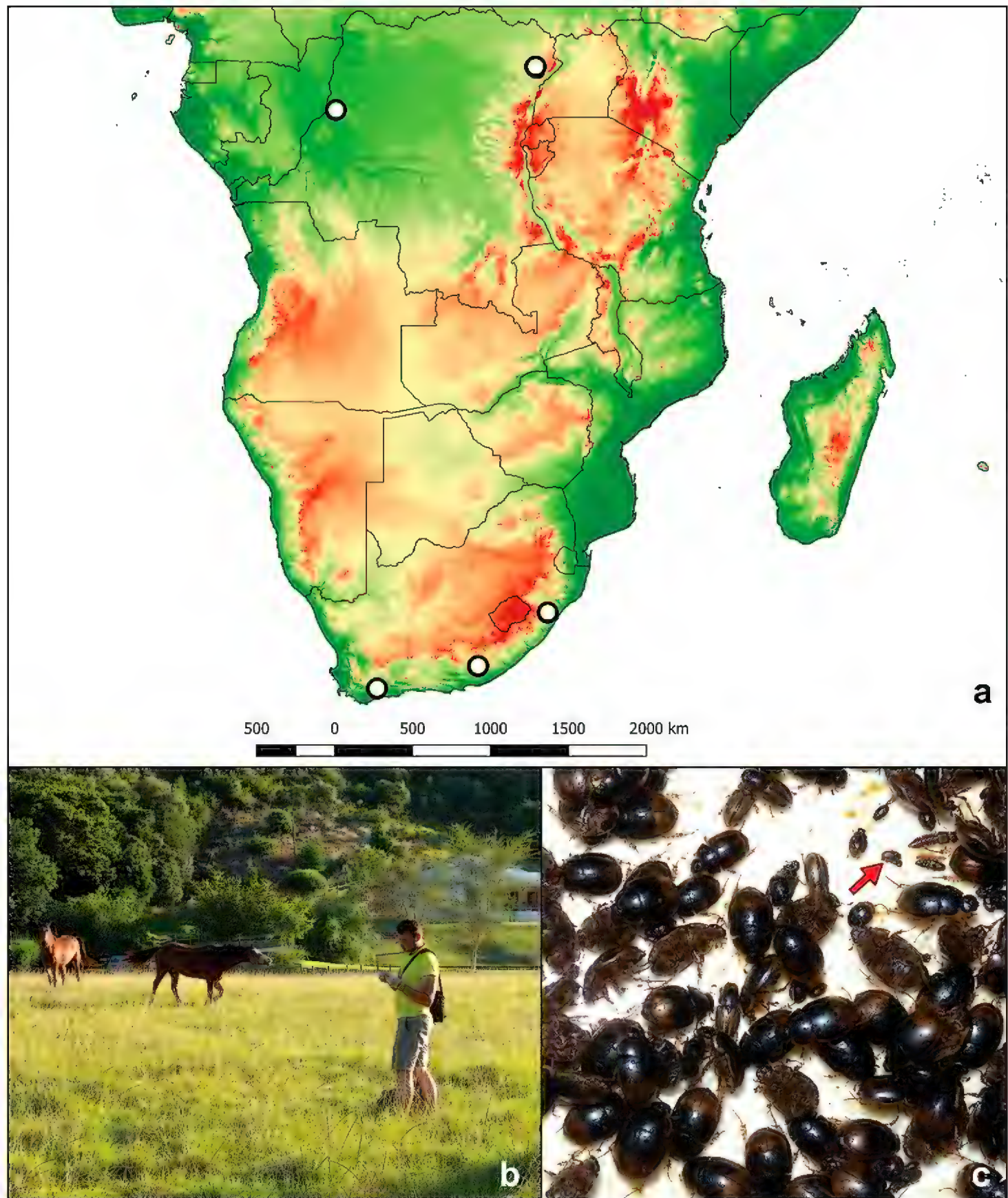


Figure 5. *Evanesternum pulsatum* (d'Orchymont) **a** distribution map **b** habitat collecting locality: Summerset Getaway Farm, Western Cape, Republic of South Africa **c** beetles collected from dung in Summerset Getaway Farm, Western Cape, Republic of South Africa. Red arrow is indicating an *Evanesternum pulsatum* (d'Orchymont) specimen.

Distribution. Known from southern Africa (Republic of South Africa: Eastern Cape, Western Cape, KwaZulu-Natal) and central Africa (Democratic Republic of Congo) (Fig. 5a).

Biology. Recently collected specimens from Western Cape were extracted from cow and horse dung in a small farm close to a river (Fig. 5b). Other hydrophilids from the same dung collected in abundance were *Sphaeridium caffrum* Castelnau, *S. abbreviatum* Boheman, *Pachysternum capense* (Mulsant) and three small *Cercyon* species (one belonging to the *Cercyon nigriceps* group and other two unidentified species). Other specimens examined were collected in unspecified type of dung while specimens from the Democratic Republic of Congo were collected from elephant excrement.

Key to the Megasternini genera and subgenera known from the Republic of South Africa

The key includes the genera recorded from the Republic of South Africa by Hansen (1999a) and Hebauer (2006). Due to unclear limits of *Cercyon* and *Parastromus*, the subgenera of *Cercyon* recorded from RSA are also included into the key to allow the identification of as many species as possible.

- 1 Prosternum with very large and deep antennal grooves reaching the lateral prothoracic margin 2
- Antennal grooves either smaller, not reaching lateral prothoracic margin, or totally absent 3
- 2 Mesoventral plate about as wide as long. Mentum at most slightly wider than long *Pachysternum*
- Mesoventral plate distinctly wider than long. Mentum much wider than long *Cryptopleurum*
- 3 Mesoventral plate truncate posteriorly, widely contacting metaventrite 4
- Mesoventral plate acuminate or rounded posteriorly, at most narrowly overlapping the anterior margin of metaventrite, or contacting it in a single point 6
- 4 Metaventrite without distinct femoral lines reaching its anterolateral corners ...
..... *Pelosoma*
- Metaventrite with very distinct femoral lines, which reach its anterolateral corners 5
- 5 Median portion of prosternum in form of an elevated plate, delimited from lateral portions by strong ridges *Pelocyon*
- Median portion of prosternum roof-like, not elevated as a whole and not delimited from lateral parts by strong ridges *Delimetricum*
- 6 Mesoventral plate widely rounded posteriorly, vanishing and indistinctly defined in anterior half. Median bare portion of metaventrite very wide, nearly reaching lateral margins. Male sternite 9 with lateral struts attached ca. at midlength *Evanesternum* gen. n.
- Mesoventral plate pointed or rounded posteriorly with distinctly defined anterior part, or very narrow (lamellar). Median bare portion of metaventrite

- never extended nearly to the lateral margins of metaventrite, at most moderately widened subanteriorly (in *Parastromus*). Male sternite 9 with lateral struts attached basally or subbasally 7
- 7 Mesoventral elevation in form of a well-defined plate of variable length and width 8
- Mesoventral elevation in form of a longitudinal keel only... ***Cercyon* (*Paracycreon*)**
- 8 Anterolateral corners of metaventrite delimited from mesal portion by arcuate ridge..... ***Cercyon* (*Arcocercyon*)**
- Anterolateral corners of metaventrite without such ridge 9
- 9 Femoral lines of the metaventrite present, very distinct, reaching anterolateral corners of metaventrite ***Cercyon* (s. str.)** (part: *C. nigriceps* group)
- Metaventrite without complete femoral lines; if remnants of them seem to be present posteriorly, they never reach anterolateral corners of metaventrite. 10
- 10 Pronotum very strongly convex, more convex than elytra in lateral view, very coarsely punctured..... ***Parastromus***
- Pronotum not more convex than elytra in lateral view. Punctuation of pronotum fine to moderately coarse ***Cercyon* (s.str)** (part)

***Cercyon* (*Acycreon*) Orchymont, 1942**

Acycreon Orchymont, 1942: 3.

Type species. *Cercyon punctiger* Knisch, 1921 (by original designation).

***Cercyon* (*Acycreon*) *punctiger* Knisch, 1921**

Figs 6a–c, 7

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Material examined. Voucher specimens: 'Fort de Kock (Sumatra) 920 M., 1925, leg. E. Jacobson // Knisch det. 1925 *punctigerum* // A. d'Orchymont det. *Cercyon punctigerus* Knisch' (5: RBINS); 'Sumatra, D.E. Museum // Knisch det. 1925 *punctigerum*' (1: RBINS); 'Insel Sumbawa // Knisch det. 1925 *punctigerum* // Latcho, Tonkin, de Cooman // A. d'Orchymont det. *Cercyon punctigerum* Knisch' (1: RBINS); 'Pagsanjan, Luzon // A. d'Orchymont det. *Cercyon punctigerum* Knisch' (1: RBINS). 'India mer., Tamil Nadu, Nilgiri Hills, 15km SE of Kotagiri, Kunchappanai, 76°56'E 11°22'N; 900 m a.s.l.; 17–28.ix.1993, D. Boukal & Z. Kejval leg. // *Cercyon* (*Acycreon*) *punctiger* Knisch det. M. Fikáček 2012' (1: NMPC).

Re-description. 2.0–2.5 mm long, 1.8–1.9× as long as wide, 2.9–3.0× as long as high. Integument shining (Fig. 6a). Colouration reddish-brown with pale palpi. Eyes without thickened ridge at posterior margin (Fig. 7a.). Mentum subtrapezoid, with anterior mar-

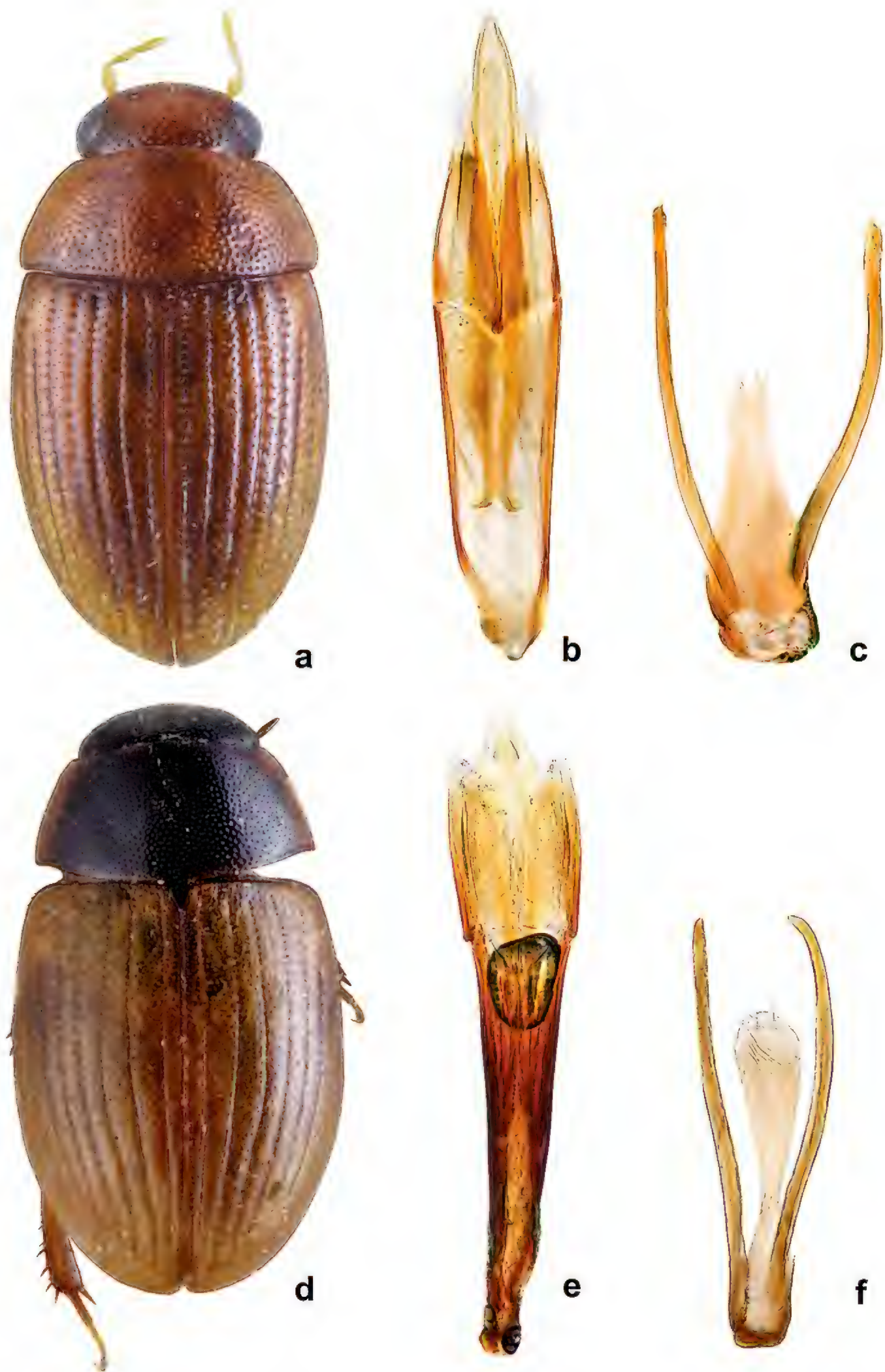


Figure 6. *Cercyon (Acycreon)* spp. **a–c** *Cercyon (Acycreon) punctiger* Knisch: **a** dorsal habitus **b** aedeagus **c** 9th sternite **d–f** *Cercyon (Acycreon) collarti* d’Orchymont paratype: **d** dorsal habitus **e** aedeagus **f** 9th sternite.

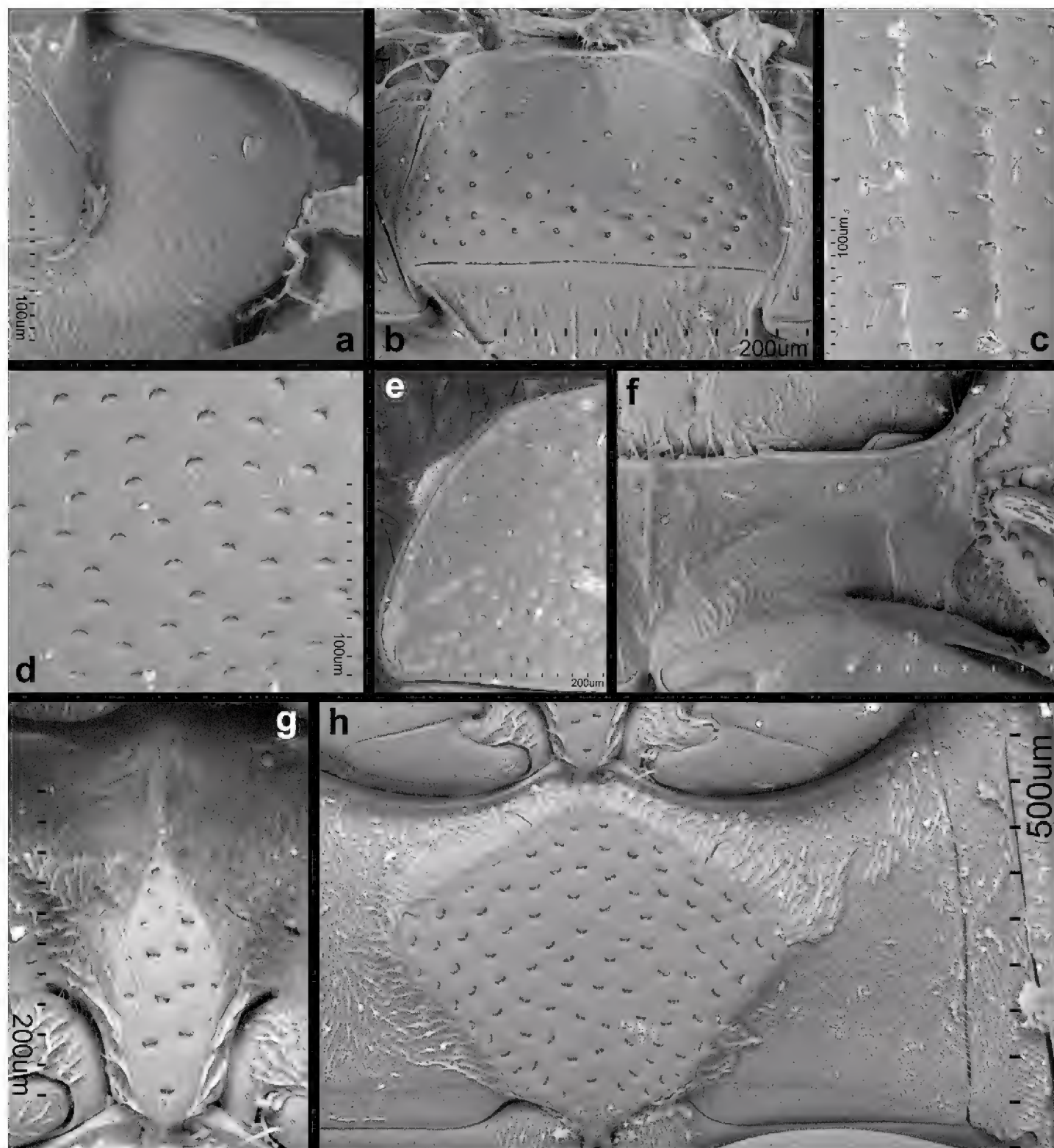


Figure 7. *Cercyon (Acycreon) punctiger* Knisch **a** ventral view of eye **b** labium **c** detail of elytral surface **d** detail of head surface **e** detail of pronotal surface and lateral margin **f** prothorax **g** mesoventral plate **h** metaventricle.

gin almost straight-lined (Fig. 7b). Pronotum with lateral margins moderately impressed (Fig. 7e). Pronotum and elytra deeply punctate without conspicuous microsculpture (Fig. 7c–d). Mesoventral elevation fusiform, short, not reaching anterior margin, procoxal rests not defined by transversal carinae (Fig. 7f). Raised portion of metaventricle about as long as wide, distinctly deeply punctate (Fig. 7h). Median lobe of aedeagus with parameres moderately broad, phallobase about 1.3× as long as parameres (Fig. 6b). Sternite 9 with median projection strongly narrowing anteriorly, lateral struts almost reaching base (Fig. 6c).

Distribution. Widespread Oriental species, recorded from Nepal, India, Sri Lanka, Vietnam, Singapore and Indonesia (Hansen 1999, Hebauer 2002).

***Cercyon (Acycreon) collarti* d'Orchymont, 1942**

Figs 6d–f, 8

Figures on Flickr. <https://www.flickr.com/photos/142655814@N07/albums/721576-89748012194>**Material examined.** Paratypes: 'Elisabethville, II-1940 // H.J. Brédo // Paratype' (2 males, 2 females, 6 unsexed: RBINS)**Re-description.** 2.0–2.4 mm long, 1.9× as long as wide, 2.8–2.9× as long as high. Integument shining (Fig. 6d). Colouration of antennae, palpi, lateral margins of pronotum and elytra and legs yellowish-brown, with head, pronotal disc, prosternum, meso- and metaventrite and abdomen black. Eyes without thickened ridge at posterior margin (Fig. 8a) Mentum subtrapezoid, with anterior margin almost straight-lined (Fig. 8b). Pronotum with lateral margins narrowly and weakly impressed. Pronotum and elytra moderately punctate without conspicuous microsculpture (Fig. 8c–d). Mesoventral elevation fusiform, short, not reaching anterior margin, procoxal rests not defined by transversal carinae (Fig. 8f). Raised portion of metaventrite about as long as wide, moderately deeply punctate (Fig. 8g). Median lobe of aedeagus with parameres broad, short, phallobase about twice as long as parameres (Fig. 6e). Sternite 9 with median projection widening anteriorly, lateral struts reaching base (Fig. 6f).**Distribution.** Only known from the Democratic Republic of Congo.***Cercyon (Acycreon) apiciflavus* Hebauer, 2002**

Fig. 9

Figures on Flickr. <https://www.flickr.com/photos/142655814@N07/albums/7215-7687839829212>**Material examined.** Holotype: 412 Sankhua Sabha Distr., Arun Valley betw. Mure and Hurure, mixed broad-leaved forest, 2050–2150 m a.s.l., 9–17 June 88, Martens & Schawaller // NEPAL-Expeditionen Jochen Martens // HOLOTYPUS *Cercyon apiciflavus* sp. n. det. Hebauer (1 female, SMNS).**Redescription.** 1.8 mm long, 1.4× as long as wide, 2.4× as long as high. Integument shining (Fig. 9a). Colouration of head, pronotum, ventral surfaces and legs dark reddish-brown with pale palpi and antennae, elytra black with apex testaceous. Eyes without thickened ridge at posterior margin. Mentum subtrapezoid, with anterior margin straight-lined (Fig. 9b). Pronotum with lateral margins narrowly impressed (Fig. 9e). Pronotum and elytra deeply punctate without conspicuous microsculpture (Figs 9d–e). Mesoventral elevation fusiform, short, not reaching anterior margin, procoxal rests defined by oblique carinae, with a deep setose pore on each side of the mesoventral elevation (Fig. 9g). Raised portion of metaventrite about as long as wide, distinctly deeply punctate (Fig. 9h).**Distribution.** Only known from the type locality in Nepal.

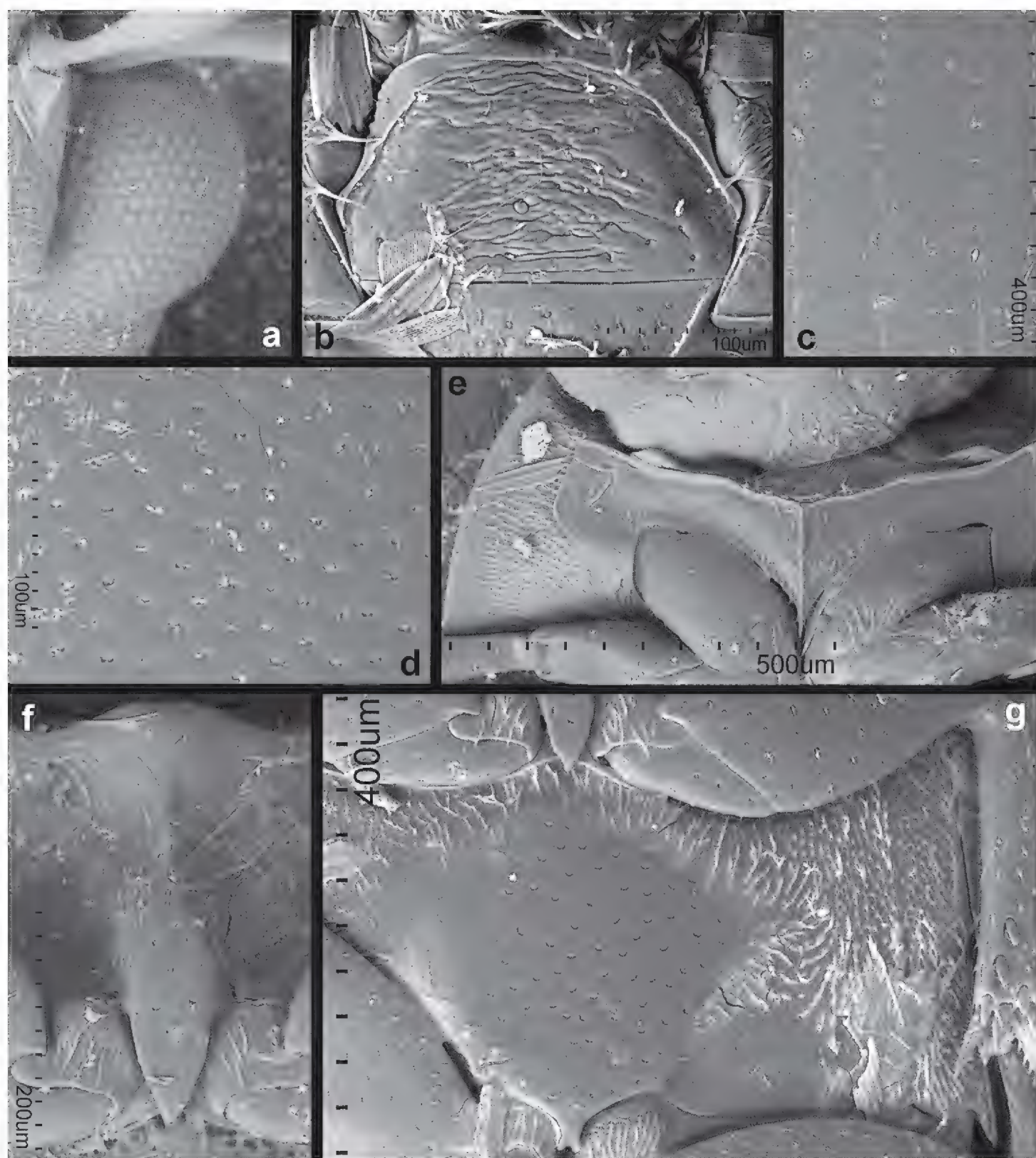


Figure 8. *Cercyon (Acycreon) collarti* d'Orchymont **a** ventral view of eye **b** labium **c** detail of elytral surface **d** detail of head surface **e** prosternum **f** mesoventral plate **g** metaventrite.

Comments. The species differs from the remaining two *Acycreon* species in the rather globular and widely rounded body. In these aspects, as well as in the morphology of the ventral parts of thorax, it is very similar to several undescribed species from the Chinese provinces, Yunnan and Sichuan (S. Ryndevich, in prep.). The deep, rounded setose pores on the mesoventrite on the side of the central elevation have not been recorded in any other *Cercyon* species and, along with the other morphological features of this species, suggest its distant relation to the type species of *Acycreon* subgenus.

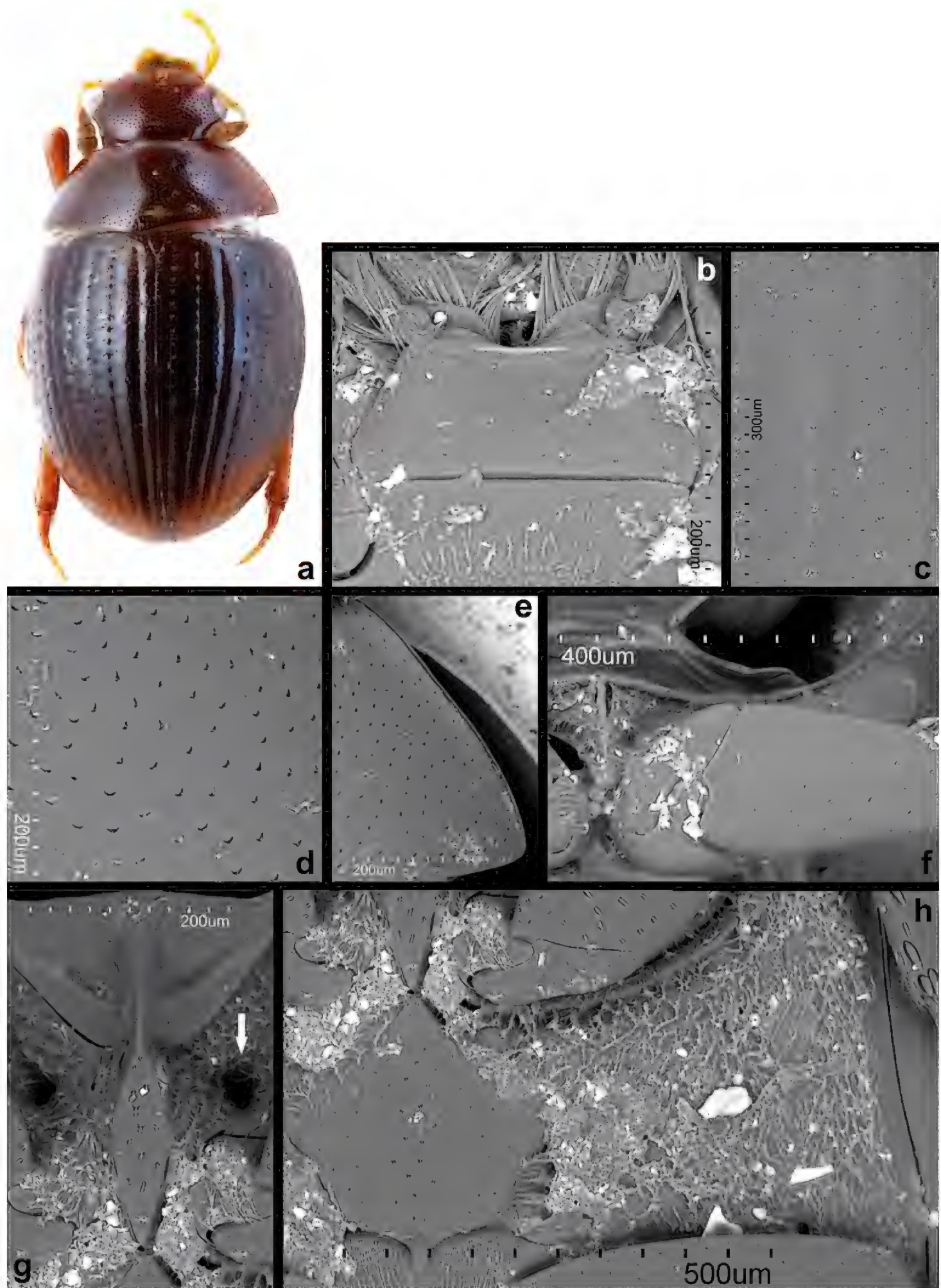


Figure 9. *Cercyon (Acycreon) apiciflavus* Hebauer **a** dorsal habitus **b** labium **c** detail of elytral surface **d** detail of head surface **e** detail of pronotal surface and lateral margin **f** prosternum **g** mesoventral plate (arrow pointing to the setose pore) **h** metaventricle.

Discussion

Cercyon is the largest genus of the tribe Megasternini, comprising over 260 described species (Short and Fikáček 2011). Eleven subgenera are considered valid at the moment: *Cercyon* (s.str.) Leach, 1897, *Acycreon* d'Orchymont, 1942, *Clinocercyon* d'Orchymont, 1942, *Oedocercyon* d'Orchymont, 1942, *Paracycreon* d'Orchymont, 1942, *Dicyrtocercyon* Ganglbauer, 1904, *Prostercyon* Smetana, 1978, *Paracercyon* Seidlitz, 1888, *Arcocercyon* Hebauer, 2003, *Conocercyon* Hebauer, 2003 and *Himalcercyon* Hebauer, 2002 (Hansen 1999a, Short and Hebauer 2006) and five more were proposed by previous authors but later synonymised with *Cercyon* s. str. (Hansen 1999a). *Acycreon* was described by d'Orchymont (1942) as a subgenus of *Cercyon* characterised by the median part of the mesoventrite not forming a complete plate-like elevation (mesoventral plate), as in most *Cercyon* subgenera, but an elongated protuberance which is carinate anteriorly and wider posteriorly (in contrast to completely carinate in the subgenus *Paracycreon* d'Orchymont, 1942, the only other subgenus without plate-like mesoventral elevation). Based on these characteristics, d'Orchymont (1942) included two species into the subgenus: the Oriental *C. punctiger* Knisch, 1921 (as type species) and the central African *C. collarti* d'Orchymont, 1942. Later, Hansen (1999) assigned *Cercyon pulsatus* (here transferred to *Evanesternum* gen. n.) in *Acycreon*, likely based on the fact that this species was mentioned as a species with 'some affinity' to *C. punctiger* in the original description. Hebauer (2002) largely followed d'Orchymont (1942) in the diagnosis of *Acycreon*, only adding that the mesoventral elevation is at least 'partly table-shaped beneath [= posteriorly]'. With some doubts, he assigned the Nepalese *C. apiciflavus* Hebauer, 2002 into *Acycreon*, indicating that it "passes over from the subgenus *Cercyon* to *Acycreon*" on the morphology of the median part of the mesoventrite. By using this concept, *Acycreon* hence contained four species (two African and two Oriental) sharing the unique morphology of the mesoventral elevation.

Evanesternum pulsatum comb. n. differs from *C. punctiger* (type species of *Acycreon*) and the other two species in the following characters: (1) male 9th sternite with lateral struts attached ca. at midlength (Fig. 1f) (basally or sub-basally in *C. punctiger* and *C. collarti* (Fig. 6c, f), not known for *C. apiciflavus*); (2) rugose-reticulate dorsal integument of head and pronotum (Fig. 4d–e) (without any microsculpture in *Acycreon* (Figs 7c–d, 8c–d); (3) medial raised part of metaventrite nearly reaching lateral margin (Fig. 4h) (present only mesally and not reaching laterally in *Acycreon* (Figs 7h, 8g, 9h); (4) thickened ridge running along posterior ventral margin of eye (Fig. 4a) (without such ridge in *Acycreon* (Figs 7a, 8a); (5) procoxal rests of mesoventrite defined by sharp transverse ridges (Fig. 4g) (in *Acycreon* without such ridges (Figs 7g, 8f) or with oblique ridges (Fig. 9g)); (6) pronotum deeply impressed along lateral margin (Fig. 4e) (at most weakly impressed in *Acycreon*; *Evanesternum pulsatum* comb. n. was mentioned by d'Orchymont (1942) as having the lateral portion of the pronotum similar to that of *C. punctiger*, but the margin is much deeper and broader in *Evanesternum* (compare Fig. 3h with Figs 7e and 9e). The above-mentioned morphological differences between *Evanesternum pulsatum* comb. n. and the members of *Acycreon* are substantial and it is

believed that *E. pulsatum* is not congeneric with them. *Evanesternum* gen. n. may, at first sight, resemble the small-bodied African megasternine genera *Delimetricum*, *Pelocyon* and *Pseucyon* or the smaller-sized species of the genus *Cercyon* (e.g. *C. minax* Balfour-Browne). The simple prosternum (i.e. not elevated medially) easily distinguishes it from all these genera except *Cercyon*. *Evanesternum* would be keyed out as *Cercyon* in the key to genera by Hansen (1991), which remains to date the most comprehensive resource for identification of Megasternini. The new genus has all the diagnostic characters of Megasternini: antenna with compact club, maxilla of male with sucking disc on galea; prosternum with antennal grooves, first abdominal ventrite carinate medially. However, it can be distinguished from *Cercyon* (as well as other megasternine genera) by the following combination of characters: (1) the mesoventral plate well-defined only posteriorly, not properly demarcated anteriorly (always well-demarcated as a complete plate in *Cercyon*); (2) mesal bare portion of metaventrite extending far laterally, covering the majority of the metaventral surface (always confined to median portion of metaventrite in *Cercyon*); (3) pronotum with deep groove along the lateral margin (absent in *Cercyon*); and (4) the morphology of male sternite 9 with very short lateral struts attaching at mid-length of the medial sclerite (lateral struts long and attaching basally in *Cercyon* and all genera of the *Cercyon*-group of genera). The morphology of the male terminalia and surrounding structures (sternite 9, articulation of the median lobe and parameres) seems to be phylogenetically informative in Megasternini, corresponding to the clades recognised by molecular phylogenetic analyses (Short and Fikáček 2013, Arriaga-Varela unpubl. data). Hence, the very unusual morphology of male sternite 9 of *Evanesternum* may indicate its rather isolated position in the *Cercyon*-group of the Megasternini. Preliminary analyses of molecular data (Arriaga-Varela, in prep.) seem to support this hypothesis.

Despite the mesal portion of prosternum being flat in *Evanesternum*, it bears a very faint demarcation of the mesal part with respect to the lateral parts by irregular diagonal sulci. These sulci 'define' the mesal portion which can be also inferred from the differences in the sculpture on the posterior margin and from the long setae present on the anterior margin. The prosternum as found in *Evanesternum* may possibly represent an intermediate condition between the flat prosternum (as present, for example, in *Cercyon*) and the mesally demarcated and elevated one (as present in genera *Cryptopleurum*, *Cyrtonion*, *Delimetricum*, *Pachysternum*, *Pelocyon* and *Pseucyon* in Africa) or a highly reduced version of a mesally demarcated prosternum.

Of the valid subgenera, *Cercyon* s. str. contains the largest number of species (slightly over 200) which are morphologically very diverse, indicating that the subgenus is likely to be an artificial assemblage of species rather than a monophyletic group. The remaining ten subgenera were created to accommodate some morphologically aberrant *Cercyon* species. They contain many less species and since they were mostly defined by some unique characters of the meso- or metaventrite, they more likely represent monophyletic groups. Still, the delimitation of some of them is unstable, resulting in frequent changes in subgeneric assignments of some species. This confusion concerns especially the subgenera *Clinocercyon* d'Orchymont, 1942 defined by the oblique, rath-

er than horizontal epipleura, which contains a very diverse assemblage of species from the Old World, with some species repeatedly moved in and in and out (e.g. Ryndevich 2007) and *Conocercyon* Hebauer, 2003 defined by a shape of the postcoxal ridge of the metaventrite (originally described for a few species from Madagascar and Seychelles, with two eastern Palaearctic species assigned to it later: Hebauer 2003, Ryndevich 2007, Hoshina 2008). Three subgenera, *Himalcercyon* Hebauer, 2002, *Oedocercyon* d'Orchymont, 1942 and *Prostercyon* Smetana, 1978, are monotypic (containing only one species). The results of this review of the subgenus *Acycreon* corresponds to the situation observed in these subgenera, i.e. it seems that the subgenus is defined by a single (and moreover weakly defined) character which picks up superficially similar but likely not closely related species. It is however surprising that this problem also concerns *Acycreon*, i.e. one of the smallest subgenera of *Cercyon* and clearly indicates that even the small subgenera need to be carefully tested for monophyly in future molecular phylogenetic studies.

After the transfer of *C. pulsatus* to *Evanesternum*, *Acycreon* contains three species, *C. (A.) punctiger*, *C. (A.) collarti* and *C. (A.) apiciflavus*. The mesoventrite of all of them forms a well-defined fusiform plate with a well-marked acute anterior tip, the plate being however rather short, ca. half as long as the length of the mesoventrite. The similarity of all three species hence concerns the relative length of the mesoventral plate, rather than the absence of the plate-like elevation mentioned by previous authors. In all other aspects, the *Acycreon* species are not very similar to each other in terms of external and genital morphology (compare Figs 6a–f, 7a–h, 8a–g) which indicates that they are likely not closely related and potentially not forming a monophyletic group. The distribution of the species (Oriental region versus tropical Africa) is also congruent with this view. Hence, even after excluding *C. pulsatus*, *Acycreon* consists of quite dissimilar species and may still be an artificial rather than natural assemblage. The concept of *Acycreon* needs to follow the morphology of its type species (*C. punctiger*) and can be only adapted after the phylogenetic position of that species has been resolved.

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